

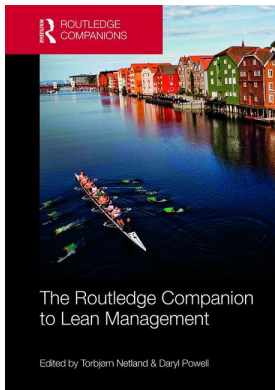
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## **The Routledge Companion to Lean Management**

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### **Lean Education**

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# 37

## LEAN EDUCATION

*Vincent Wiegel and Lejla Brouwer-Hadzialic*

### Introduction

“I taught my dog Chinese.”  
“Let’s hear it talk.”  
“He can’t.”  
“I thought you taught it Chinese?!”  
“Yes, I did, but he just didn’t learn.”

This age-old joke nicely illustrates that education has two core processes: teaching and learning. The fact that value is created through processes that intensively involve both the “customer” (student) and the “supplier” (teacher) is highly significant. There are few domains in which customer involvement is so strong and the value creation process is to a substantial extent taking place in an environment (inside a student’s mind, his or her home, the playground, etc.) that is outside the view and direct control of the supplier.

Learning and teaching are very old processes that humankind has been doing for millennia. Theories on learning and teaching are almost as old and as varied. Much has been learned about learning and teaching over all these years. When considering *lean education*, it is important to keep in mind that pedagogy has a long and rich history to which lean education needs to relate. Therefore, we believe that to understand what lean education is and its impact on education, we must begin with pedagogy. Focusing on both teaching and learning, we go along with the definition of Watkins and Mortimore (1999) in which they refer to pedagogy as more than only the teacher’s role and activity. In their definition, pedagogy is “any conscious activity by one person designed to enhance learning in another” (p. 3). Ultimately, it is the learning that matters.

Currently, most of the lean education practices focus on the support processes known as “student administration.” There are few lean education practices that actually engage teachers in the primary processes of teaching and learning. These mostly involve teachers who teach lean and then consider applying lean thinking to their own teaching. These teachers face challenges as they try to apply lean beyond their own course and circle of influence. They are the peers who tell their colleagues how to improve their teaching. In addition, they face the institutional inertia of schools with strong cultures, vested interests, and many governmental regulations. These are

factors that, in themselves, are far from unique but make for a challenging environment when combined. Moreover, it seems that lean educators are perhaps not always the best change agents. Teaching lean and applying lean are two different things, though we would argue that good lean practitioners have to be good teachers (as well as good students!).

In this respect, we expect and hope that this chapter will appeal to all readers irrespective of the application domain they are working in. Whether we are lean academics, lean practitioners, or both, we are engaging in some form of teaching. As such, we encourage the reader to practice some *hansei* (critical self-reflection) on his or her own lean teaching practice. How “lean” is it? What lean practices are applied explicitly?

In Section 2, “What is lean education?,” we consider the following four factors that shape the domain of lean education:

- 1 co-creation of value when the process of teaching and learning happens simultaneously; there is a need to deal with inherent variation in students;
- 2 lean concepts, such as customer and waste, with domain-specific denotation;
- 3 the relationship with domain technology (by which we mean pedagogy); and
- 4 the need for an integrated approach in which organizational strategy and primary and secondary processes are addressed as a whole.

These factors stem from the nature of education and have a profound impact on how lean can be applied in education.

Section 3 examines the challenges and opportunities in lean education. The challenges lean education faces can be categorized into three groups. The first group consists of the integration with pedagogy. Since education is as much about learning as it is about teaching, the study of how this learning takes place and how best to organize teaching needs to be taken into account. The view on pedagogy will affect the way processes are organized. The second group consists of the need for an integrated approach across the educational institution. The domain of education generally lacks a practice of policy deployment, which is an impediment to the implementation of lean. The third group consists of adapting lean techniques to take structural differences in the domain into account. Education is characterized by strong input variation (students have differing mental, behavioral, and cognitive abilities and attitudes) and inherent co-creation—education is as much about learning as it is about teaching. Thus, there is a need to apply varying teaching and learning strategies depending on the specific situation of the students involved. The implication is that some of the traditional lean techniques might not be well suited or may be in need of adaptation.

The close alignment of pedagogy and lean thinking offers an opportunity for stronger education. Pedagogy has a clear process focus (William, 2011; Hattie, 2012). It focuses on the goals to be achieved and the associated success criteria. Frequent checks on progress and adjustments are an integral part of the educational process. This approach has obvious similarities to the concepts of *kaizen* and improvement *kata*, and to lean thinking as process thinking. Pedagogical approaches are typically weak on the *how* of their recommendations. With its holistic, coherent, and practical outlook, lean can help in implementing pedagogy.

The alliance of pedagogy and lean opens a new perspective on education, described in Section 4, “The future of lean education,” in which students “pull” the needed knowledge based on their state of development, personal abilities, and preferences. Teachers create a learning environment in which they both teach and provide the context-relevant content. Defining a target condition with its success criteria and the monitoring of progress are both key in the environment and its learning process. This learning-centered teaching process is supported through

administrative processes. Lean methods are used to align strategy and support processes toward this learning environment. Short cyclic continuous improvement practices are an integral part of the educational organization. Scarce resources are freed up through the elimination of waste.

Let us state three of our “prejudices” at the start as well. First, we do not believe in learning in which students are just provided with access to all kinds of information through their tablets and look up whatever they need to know. A student needs knowledge before he can ask a meaningful question. The teacher is not just a conduit for information. She is teaching from a position of deep subject matter expertise. However, she is not “just” teaching, but also helping students reflect on their learning and creating their own learning strategies. Second, while we think that information technology (IT) has to play an important role in education as it does in almost any other sector of the economy, we do not believe IT is the main driving force that is going to propel education forward and solve its problems. The hailing of massive open online courses (MOOCs) as the solution to budget cuts (because of large-scale teaching) and quality (a few of the best teachers are producing the MOOCs) is off the mark. IT will, however, be an important enabler for a more diverse set of learning strategies. Third, lean education practices, improvement efforts, and conferences are currently focused too much on the improvement of support processes irrespective of learning and teaching. Lean education needs to always and explicitly include students and teachers and address the primary processes of education if it wants to be more than lean services applied to the domain of education.

### What is Lean Education?

Lean education differs from other traditional application domains, such as manufacturing, in three dimensions (Wiegel and Brouwer-Hadzialic, 2015), in that it 1) encompasses strong co-creation, 2) faces inherent input variation, and 3) is characterized by the application of multiple, varying technologies:

- 1 Students are to a large extent both the consumer and the producer and thus their participation in the process is key. Their participation is formed and facilitated through pedagogy adopted in the primary processes of teaching and learning. The support processes, such as administration and scheduling, contribute to the student’s journey. These processes are an integral part of the total educational offering.
- 2 Students entering the educational system vary widely in terms of their skills, ambitions, knowledge, etc. These differences constitute what one could call “input variation.” Such differences affect preferences of how information is presented and processed, group and individual work, timing of work, size of assignments, etc. These preferences are not merely individual whims but reflect physiological/mental processes. All of these affect the learning and teaching processes. Dealing with these variations is key in successful teaching. In short, some (but certainly not all) variation is inherent in the processes of education.
- 3 The presence of variation then requires the deployment of various technologies. In education technology consists of a set of pedagogies and teaching methods. A particular combination of these constitutes a learning-teaching strategy. Depending on the progress of students and the success of teaching and learning, a teacher will vary the learning-teaching strategies. A substantial part of a teacher’s work consists of finding out what does and does not work for a student. Along these lines, Hattie (2012) notes as follows:

A typical lesson never goes as planned. Expert teachers are skilled at monitoring the current status of student understanding and the progress of learning towards the

success criteria, and they seek and provide feedback geared to the current understanding of the students . . . . Through selective information gathering and responsiveness to students, they can anticipate when the interest is waning, know who is not understanding, and develop and test hypotheses about the effect of their teaching on all of the students.

(p. 30)

All these aspects together are reflected in a learning environment in which a student is challenged, provided with information, distracted, etc. Students and teachers work together in varying physical and digital settings to share information, comment on work, reflect, provide feedback, ask questions, and do project assignments. Lean education is geared toward the creation and improvement of this learning environment. According to Wiliam (2011),

The teacher's job is not to transmit knowledge, nor to facilitate the learning. It is to engineer effective learning environments for the students. The key features of effective learning environments are that they create student engagement and allow teachers, learners, and their peers to ensure that the learning is proceeding in the intended direction.

(p. 50)

From a lean perspective, the student is the main customer, or consumer if you will. As in any domain, there are various stakeholders. Leave out the students, however, and all other stakeholders will disappear. Even so, the student cannot always be said to be a customer in the economic sense. Students in primary and secondary schools are mostly underage and are thus not permitted to make important decisions on their own. Legally speaking, their parents are perhaps the "customer." However, in all teaching and learning processes the student is clearly the one for whom the value is produced and toward whom everything is geared. In part-time and vocational education, companies are clearly important stakeholders and might even pick up the bill. However, as in the case of parents, they are not the customer. For-profit schools might have yet another, different, relationship with their stakeholders. In all cases, however, we maintain that the underlying insights in learning and teaching remain the same.

Determining what type of students a school caters to requires strategic choices in conjunction with legal requirements. Different types of students will need different forms of support and different types of pedagogy will have different needs in terms of group size, IT facilities, and classroom organization. These are not merely economic considerations; they determine what kind of school to what kind of students an organization is. They affect all processes throughout the organization, regardless of the choices made.

Taking all above observations into consideration, we define lean education as follows: lean education is an organization-wide strategy that aims at generating value for students and supports the chosen pedagogical philosophy through:

- 1 alignment of the whole organization and its processes to create an effective learning environment, and
- 2 short cyclic continuous improvement of the learning environment and elimination of waste.

Next we consider what constitutes value and waste in education. Waste is to be found in teaching, learning, and support. Value is the provision of any materials that contain information and instructions that allow the student to acquire skills, knowledge, and attitudes, and an

environment in which these can be exercised, practiced, and developed to a level desired by and suitable for the student. Paraphrasing Womack and Jones (2005), we maintain that lean education is about:

Helping the student deciding what he wants and needs to learn,  
and subsequently teaching the student according to  
what he wants and needs to learn,  
how he wants to learn,  
when he wants to learn,  
not wasting his time,  
teaching in a stimulating environment where  
all necessary materials are available,  
easily accessible and functioning, and  
geared towards the intended goal.

Of course, we are not advocating that students should just “do whatever they wish.” As in any domain, from healthcare to building, there are obvious limitations, legal, moral, and otherwise, that to some extent restrict the customer.

With this view on lean education in mind we can take a fresh look at educational practices and elucidate some key lean concepts within the context of education. Consider, for example, the waste of overproduction of information in the form of PowerPoint slides (Emiliani, 2004). We witness in our daily practice that (we) teachers love to talk about the subject we teach. Therefore, in most of the lectures (fixed time) we are the ones pushing the information and knowledge toward the students by using many slides and explanations. Even though we strive to accomplish the pedagogical goals and increase the learning output, the analysis of our own teaching practices showed that about 80 percent of what we were doing when teaching was a classroom style (fixed format) where the teacher was presenting about one slide per minute with little space for student–teacher interaction.

Note in the context of education the unevenness created through the yearly cycles of teaching, with the subsequent divisions and semesters, trimesters, etc. marked by holidays. While these divisions are to some extent legally prescribed, they are also the result of long-standing traditions that date back to pre-industrial ages. These divisions are not necessarily productive and conducive to learning. They lead to peaks in teaching and learning work and consequently overburden students and teachers. Waste is the result. For example, part-time students who work and study need to align their study with their work. For companies, the end of the year is generally a busy time. The students are very busy submitting year-end reports, closing books, etc. Teachers also tend to want to close their semester “books” and schedule exams and assignments around December and January. This causes a huge peak in both work and study. This is further aggravated by students not doing their learning throughout the year but instead cramming just before the exam. The resulting waste is that students do not really integrate much of what has been taught.

Lean education is characterized by its forms of waste. Various authors have provided insightful examples and categorizations of waste (see Emiliani, 2004; Balzer, 2010; Antony et al., 2012). The overview of these and other authors includes between 9 and 40 categories of waste. These categories are subcategories of the widespread list of eight categories.

For the domain of lean education, the notion of co-creation is important. This means that in defining waste we need to adopt the perspective of both producer (teachers and administrators) and the co-producing customer or consumer (students). In Table 37.1 we give an overview of a few examples of waste per category and role.

Table 37.1 Waste in education

<i>Type of waste</i>	<i>Student</i>	<i>Teacher</i>	<i>Administrator</i>
Transport	From one classroom or location to another.	From one classroom or location to another.	Moving files and brochures across locations.
Inventory	Material to be studied. Assignments to be completed.	Student work to be graded. Teaching materials to be prepared. Lessons to be evaluated.	Applications to be processed.
Motion	Looking for and assembling information about schedule, classroom, required reading.	Looking for students. Searching for emails.	Switching from one system to another. Looking for files.
Waiting	Waiting for feedback on essays.	Waiting for input from other colleagues on teaching materials, literature.	Waiting for information from other departments.
Overproduction	Learning/processing too many materials.	Teaching/producing too many materials.	Requesting and processing more information than needed. Producing reports that are not read.
Over-processing	Including more references than required for an assignment.	Creating convoluted file structures. Repetitive instructions.	Producing repetitive letters. Producing reports containing too much detail.
Defects	Classroom disturbances. Reading wrong materials. Re-learning lessons forgotten due to long holidays.	Incomplete or wrong teaching materials. Assigning the wrong group work.	Dealing with incomplete information.
Talent	Teaching materials geared toward average students. Looking for instructions.	Administrative work. Finding short cuts around non-functional systems.	Repeat data entry.

Taiichi Ohno called overproduction the most important form of waste in the context of mass production. In high-variety low-volume production, waiting is the main waste. For education, talent is the most important waste, including the talents of students that are not addressed or remain underdeveloped and the talents of teachers that are wasted on administration and thus are not used to develop students' talents. All other wastes are waste because they distract from the development and deployment of talent.

The application of lean thinking to education seems to fit nicely. Until recently, however, lean education initiatives were few and far between (Hines and Lethbridge, 2008). Currently, we witness rising interest at all educational levels from primary schools to higher education. There are case studies about primary and secondary education in the US and the UK as well as some on primary schools in the Netherlands and Norway (Eden, 2014; Netland, 2015), which show how lean tools are used to increase the learning output for the pupils and to improve the working environment for the teachers. Emiliani (2004) focuses on the improvement of teaching in the context of higher education. Previous studies (Hines and Lethbridge, 2008; Balzer, 2010; Antony et al., 2012; Radnor et al., 2014) have shown that lean education usually focuses on the

improvement of support and administration services. One of the pioneers in this field is the University of St Andrews in Scotland, which has adopted an approach now known as “The St Andrews Model” (Robinson and Yorkstone, 2014). The number of lean education conferences and the number of conference attendees are growing, as is the number of educational institutes that engage in lean. The Lean Higher Education hub (2015) provides a nice illustration through an interactive world map detailing higher education institutions where lean continuous improvement teams are active. The number of case studies is growing. However, we are still in the very early days of lean education. A critical mass is emerging that makes it likely we will witness the development and spread of lean thinking akin to that of, for example, lean healthcare and lean construction.

### Challenges and Opportunities

There are three specific challenges facing the application of lean in education. The first challenge, integration with pedagogy, is highly specific to the domain of education. We often refer to pedagogy (singular) as if there is only one theory of pedagogy when, in fact, there are many different theories. While we focus on some common features, we still ask the reader to bear in mind that this is not a chapter on pedagogy even though it plays an important role in the view on lean education.

Pedagogy is often strongly and expressly process oriented in nature. Writing about formative assessments, Wiliam (2011) observes that “assessment is the central process in instruction.” In his view, teaching is about establishing where the students currently are, defining the learning goals with success criteria, and then creating a learning environment that is conducive to learning. In Wiliam’s (2011, p. 45) view, “All teaching really boils down to three key processes . . . : finding out where the learners are in their learning, finding out where they are going, and finding out how to get there.”

In a similar vein, Hattie (2012, p. 53) refers to the need to “share the learning intentions with the students, so that they understand them and what success looks like.” The role of assessments is to decide how to take the next step. Assessments should be designed by thinking backwards from the decisions that need to be made. In lean terminology, we see target conditions, a kata, and process thinking with the end in mind. Rother (2010) describes the process of setting a target condition as starting from a deep understanding of the current condition: “once you take a step the learning process begins” (Rother, 2010, p. 124).

Writing about learning to learn, Hattie (2012, p. 104) indicates the importance of different strategies students can apply in learning: “the heart of learning to learn: it is about *intention* to use, *consistency* in appropriately using the strategies, and knowing when chosen strategies are *effective*” (emphasis in the original).

There is a lot of hansei called for on the part of the student and the teacher alike, in the type of pedagogy envisioned by Wiliam and Hattie. There is much common ground with lean thinking. Most lean practitioners and researchers seem to be missing this point when applying lean to education. Balzer (2010) and Antony et al. (2012) make this point nicely when remarking on a strong tendency to use lean speak rather than education speak. We suggest two reasons for this missing out on the common ground. One, lean practitioners often just do not take the time to consider the existing education setting. Two, lots of teachers do not teach according to the pedagogy they were once taught.

Any lasting successful attempt at introducing lean in education needs to address the primary processes. In order to do so, it needs to relate to pedagogy. In addition to the process mindset, pedagogy consists of theories on knowledge, methods to acquire knowledge, and ways to test



students' knowledge. These methods are very specific to the domain of education and have little overlap with lean methods. Lean practitioners would do well, however, to take note of insights from pedagogy.

The challenge to relate to pedagogy is also a huge opportunity. Pedagogy and lean are natural allies and are very closely related on a conceptual level. This should give the lean practitioner an advantage when applying lean to the primary processes. Adopting the language of teaching and learning, following the process orientation a lean practitioner should have little problem relating to educators.

The lean contribution can be manifold. Foremost in our view are the following two contributions: seeing the whole and execution. First, teachers are often deep into the daily micro-aspects of teaching, including making sure the projector works, grading the exams, providing feedback, preparing the sheets for the next lesson, etc. It is easy to lose sight of the whole process and its end—the learning intentions. Visualizing the whole process, standardizing it, and tracking progress through visual management help the teacher to integrate activities and focus on what matters most: assessing progress and selecting learning strategies. For example, when handing out an assignment, we sometimes ask the student what grade she would like to achieve. We then discuss the various success criteria associated with the progressive grades. In subsequent discussions, progress toward the desired grade is tracked. Second, even though pedagogy explains the need to vary learning strategies, track progress, etc., it is hard to do so. Pedagogy is not always very articulate when it comes to the “how” question. With its execution-oriented tradition and techniques, lean can contribute through visual management techniques, work instructions, etc. These need to be detailed at such a level that individual students also know how to operate and use them to “pull” instructions, assignments, and information when needed and provide feedback on their progress.

A prime example of poor execution practices is the process of evaluation and improvement of teaching. Every teacher has been taught that course evaluation and improvement activities are key. Structural evaluation of courses and classes is not a common practice. The evaluation that is being done is too abstract and the cycles in which it is carried out are too long to be effective. Many courses are evaluated only at the end after the exams and tests have been done. They seldom address individual teaching sessions or materials. The evaluation is too late for the students and teachers to remember either what was done, or what did and did not work with any precision or relevance. Daily starts, rapid improvement sessions, and improvement kata are just a few lean techniques that can help conduct the needed short cyclic continuous improvement activities in education. We use, for example, smartphone apps to solicit focused student feedback on a small number of items. We act on the items and report back to the students. In parallel, we hold more in-depth interviews with a selection of students to deepen our understanding. For both approaches we experimented with the frequency of the feedback and the breadth and depth of the topics covered.

Adopting the lean techniques and showcasing them for education is a primary task for lean education practitioners that will help gain trust and support. Examples from primary schools in the Netherlands and Norway show visual improvement boards being used to solve problems, track progress, and much more (Eden, 2014; Netland, 2015).

The second challenge, the need for an integrated approach encompassing primary and secondary processes as well as strategy, is not inherent to education per se, but rather is highly typical of the situation in education. The process of teaching has always had the predominant position in education. However, it has only been loosely coupled with the secondary processes that are at best a diversion from the so-called “real job.” The approach to secondary processes has been minimalist and focused on just making sure things work, i.e. the lights are on, the classes are clean, the

schedule works, etc. The services provided are not considered an integral, important, and constructive part of the total value delivered.

As the scales of schools have grown, the management of the secondary processes has become increasingly removed from the primary processes. The scale and the associated costs afforded the administrators and managers of the secondary processes more influence. IT systems, upscaling schools with large numbers of students, and standardized enrollment and planning processes became more noticeable in the process of teaching, but in a negative, constraining sense. This caused a more antagonistic relationship between the colleagues involved in the support and the teaching processes.

Lean has various contributions to make in this respect. Seeing the whole both at the value stream level and at the organizational level is the overarching goal. To achieve this, applying lean techniques to map the value stream and linking primary processes and support processes contributes to integrating teaching and administration. Policy deployment (*hoshin kanri*) helps to integrate all efforts at the organization level. X-matrices and target trees are mostly foreign to lean education. We have found that these help administrators and educators to bring coherence to the myriad developments they are facing. Antony et al. (2012) summed up 12 of these challenges, including “lack of visionary leadership,” “weak links between continuous improvement projects and strategic objectives,” and “lack of communication at various levels across the higher educational institutions.” Several of these challenges are also reflected in Balzer’s (2010) work.

The third challenge concerns structural differences in the domain that will require reconsideration of core lean concepts and techniques. Various authors have pointed out some structural differences among the application domains (Bateman et al., 2014; Radnor et al., 2014; Wiegel and Brouwer-Hadzialic, 2015). Bateman et al. (2014) refer to the ambiguity of the pull principle when applying lean in the service sector. These differences need to be addressed as well. We have denoted three dimensions that characterize and differentiate education from the traditional domains of lean application: strong co-creation, inherent input variation, and application of multiple, varying technologies.

Co-creation is hard to capture in a traditional value stream map. Co-creation means that the consumer is also the supplier—or the input if you will—to the process. Important parts of the process are actually taking place outside the physical and digital premises of the supplier. The interaction between suppliers and customers becomes complex, frequent, and multifaceted. The customer becomes the supplier when providing feedback to fellow students or when doing exercises. The interaction is frequent, i.e. many times a day, many days a week, many weeks a year. Some interactions are synchronous, e.g. classroom teaching or one-on-one feedback, while other interactions are asynchronous, e.g. giving assignments or sending instructions through blackboard or email. Added to the co-creation is the fact that the artifacts produced vary across a wide range, including clay models, essays, project reports, and video clips. Therefore, the number and kind of “products and services” that are flowing through one value stream vary considerably. In this case, using service blueprinting as a technique to capture the value stream is probably more effective.

This also means that one needs to reconsider the concept of “takt”: it should take account of student effort rather than a number of artifacts to be produced or consumed. It also needs to be formulated at the level of the individual student rather than at the classroom level. As there is inherent variation among students, both the form and pace will vary.

From this variation follows the need for the application of many different best ways to do a particular activity rather than one best standard way to do a particular activity. By activity we mean teaching a specific topic. The drive toward the reduction of variation can be counter-productive in education. Not all variation is bad and some variation just cannot be eliminated.

Interestingly, we find that the increase in variation also increases the need for standardization in order to keep the variation manageable. This idea is akin to mass customization.

### The Future of Lean Education

Lean education in the coming years will function as an enabler and driver for the creation and maintenance of an effective learning environment—an environment in which the talents of students are further developed and the teachers’ talents are deployed (and, of course, further developed). Lean education will bring to education the notion of a student journey that needs support through aligned processes, in terms of both primary teaching and learning processes and secondary support processes. Lean education will help visualize the student journey and identify the wastes. Through the introduction of short cyclic continuous improvement activities, students and teachers become joint student investigators of effective learning strategies. Lean education helps in the articulation of a future state and the subsequent deployment of pedagogy and process improvement at the level of both the educational institute and the individual student. An effective learning environment plays an important role in lean education. An effective learning environment is one in which the following are evident:

- 1 students and teachers determine the learning goals and success criteria and visualize them;
- 2 learning–teaching strategies are developed and deployed that fit the students’ needs;
- 3 the progress toward the goals and the effectiveness of the strategies are tracked and adjusted when needed;
- 4 the student actually achieves the set goals.

Lean education, then, plays an important role in the visualization of the student journey, including the goals and progress. Through techniques such as the improvement kata and five whys, lean education helps teachers and students investigate what works and what does not. Standardization of strategies makes it easier to deploy and track their effectiveness. Lean education helps to introduce shorter continuous improvement cycles. The notion of waste in education focuses the improvement efforts.

As teaching and learning is not just about pedagogy, lean education also contributes to the improvement and alignment of all support processes. Constructing and maintaining a physical and digital infrastructure that is highly flexible and adaptable is key to the deployment of varying learning and teaching strategies. Buildings and digital environments are both far from flexible. Their design is far removed from the primary processes of learning and teaching. By focusing the physical infrastructure on different uses through, for example, single-minute exchange of die (SMED) techniques, lean can help administrators create an environment better suited to the needs of students and teachers. Helping teachers create digital content that can be accessed by students when and where they want will increase the flexibility and adaptability of the learning environment. Ultimately, support processes in lean education are organized not according to their own economic or bureaucratic logic, but instead according to their overall contribution to the learning environment and the extent to which they help eliminate the waste of talent.

As there will be practical and economic limits to flexibility and adaptability, administrators will need to make strategic decisions regarding what kind of school they want to be and which kind of students they want to serve. Defining and deploying such a strategy is not currently common practice in education. Lean expertise can thus be usefully applied in this area. School administrators’ main tasks will be to align processes toward the single goal of an effective learning

environment and ensure the execution of systematic, short cyclic continuous improvement activities. The lean teaching and learning that unfolds can be described as follows:

As students mature intellectually and have experience in the classroom and in the world, they can become members of a democratic classroom. In a democracy, teachers and students co-create the syllabus. In order to be self-determining beings, students must make the key choices how the class should be run: class structure, grading, books, etc. But when students come into a course in which they have little or no knowledge, this proves to be a herculean task. This is why the course should begin with tentative guidelines suggested by the instructor. As the course progresses and students get what is going on, then the real syllabus will be co-created. . . . Teachers lead through the authority of reason, not by the reason of authority.

(Mills and Miller, 2002, p. 104)

### **Case Study: Lean Education in the Bachelor of Nursing Study at HAN University**

After a few years of nationwide research and redevelopment, the new body of knowledge and skills for the Bachelor of Nursing 2020 was established in the Netherlands in January 2015. The educational institutions throughout the country who offer an undergraduate curriculum in Bachelor of Nursing (BoN) were already making plans to revamp their curricula. At the HAN University of Applied Sciences (HAN), the program director of Nursing Studies had an extra challenge to manage. The curriculum has to accommodate the needs of part-time students (studying and working), including learning at the workplace and devising flexible learning routes that lead to a diploma. Furthermore, the curriculum is intended to promote and improve lifelong learning practice in the Netherlands. The Executive Board at HAN embraced and promoted lean as the philosophy that can help to achieve these goals.

The project team for Curriculum Development BoN was installed and the decision was made that the first part-time students for the new program would enroll by February 2016, meaning that the enrollment procedure would start in October 2015. This was challenging, however, since the BoN had not been running since 2013 due to low enrollment numbers. The project team's key goal was to develop a high-quality, sustainable, financially sound curriculum that adds value for the student, workplace, and society. Other HAN programs struggled with the same issues. Lean offered them a structured and integrated approach for making the changes. The project team got a lean advisor on the board to support three project leaders who looked after content, support services and administration, and project management. Together they started to build a *lean model cell* and redevelop the whole curriculum, primary and support processes.

*Personas:* The first step we took was getting to know the student and his or her journey from selecting a course to enrolling and later from learning to examination. Together with the curriculum developers and teachers, we interviewed about 40 potential students and described personas we used later to develop the content and define the pedagogical vision.

*Vision and strategy:* Together with the program management team, we went through the institute's vision and used the X-matrix to connect ambition, pedagogical vision, improvement initiatives, and goals. Decisions were made about which personas the study would focus on in the first year and what

goals the program would achieve in two to three years. Moreover, the management team stated what type of nurse the study would educate.

*Curriculum development:* The personas together with the (pedagogical) vision and strategy statements provided the direction for the development of the curriculum. The planning and monitoring was established using the performance board meetings. The three project leaders were coached based on the improvement and coaching kata.

*Support services and student administration:* As creating an effective learning environment also means aligning support services and administration, special attention was given to this part. For example, enrollment needs to take into account specific workplace circumstances that will affect assignments and teaching later on. A project leader was assigned to make sure that the student journey was supported by the organizational journey and aligned with the vision and strategy as stated and deployed by the management team.

At the time we are writing this chapter, over 120 students have already enrolled solely through word of mouth, way over the number needed to start. The discussion between the management team, project team, curriculum developers, and teachers is based on the shared vision and transparency. The process has not been without hiccups, but at this moment the program is meeting the development requirements. More teaching programs at HAN University are now willing to adopt the lean approach.

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